

## Reducing Systematic Bias Variation in Global Ionosphere Maps to Support Satellite Altimeter Calibration

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Performing measurements of mean global sea-level change using TOPEX observations requires a careful accounting of possible long-term drifts in the altimeter calibrations. Characterizing the accuracy of the ionospheric delay correction over several years is an important step in this process. Independent estimates of ionospheric delay that can be compared to TOPEX are available from the Global Positioning System. The GPS receiver located at Harvest is ideal for these comparisons since the TOPEX satellite flies directly overhead once per ten-day cycle. These comparisons are indirect, however, because TOPEX radar signal paths are not generally aligned with GPS satellite lines of sight. The vertical delay above the receiver must be inferred from direct slant path observations using well established mapping techniques (estimates of GPS instrumental biases are also part of this process). Unfortunately, limitations of the ionosphere model used in this retrieval procedure can introduce biases in the vertical delay estimates. These biases can drift over time scales of several years due to ionospheric variations expected over the 11-year solar cycle, thereby interfering with TOPEX/GPS ionospheric delay comparisons over similar time scales. In this study, we investigate methods of retrieving vertical ionospheric delays from GPS that minimize systematic biases caused by ionosphere mismodeling. The vertical delays can be retrieved more accurately than standard methods by adding parameters that vary with the three-dimensional electron density structure. Using simulation studies and real data, we will demonstrate a vertical TEC retrieval method sufficiently accurate for assessing TOPEX ionosphere calibration drifts to within 1 mm/year. We will then outline our approach to validating TOPEX ionosphere corrections over the mission lifetime using overflight opportunities at the Harvest receiver and elsewhere.